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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/099,800	03/13/2002	Kent Kuohua Chang	JCLA8579	3086

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EXAMINER

DOAN, THERESA T

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 12/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/099,800

Applicant(s)

CHANG, KENT KUOHUA

Examiner

Theresa T Doan

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 September 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-3, 5-6, 12-13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yu (U.S. 6,521,502) in view of Applicant's Prior Art (APA).

Regarding claims 1 and 12, Yu (figures 1-6 and related text) discloses a method to suppress a short channel effect of a semiconductor device, comprising:

forming a gate structure 14 on a substrate 12;

performing a first ion implantation to form a source/drain extension region (40/42) in the substrate beside the gate structure by using the gate structure 14 as an implantation mask (figure 3);

forming a spacer 26 on a sidewall of the gate structure;

performing a second ion implantation process to form a source/drain region (54/56) using the spacer as an implantation mask (figure 6);

performing a pocket ion implantation process to form a pocket doped region 50/52 under the source/drain extension region after the formation of the source/drain extension region 40/42 (see figure 4) wherein no thermal process is conducted before

the formation of the pocket-doped region, the source/drain extension region and the source/drain region; and

performing a rapid thermal process to anneal the source/drain extension region, the source/drain region and the pocket doped region concurrently (column 6, lines 42-46).

Yu does disclose the forming of the pocket ion implantation 50/52 before the forming of the source/drain region 54/56, but does not disclose the forming of the pocket ion implantation 50/52 after the forming of the source/drain region 54/56. However, APA (figures 1A-1E) teaches the forming of the pocket ion implantation 116 after the forming of the source/drain region 112. Accordingly, it would have been obvious to reverse Yu's process steps by forming the pocket ion implantation after the forming of the source/drain region because it has been held that reversing the order of the prior art process steps involves only routine skill in the art. *In re Burhans*, 154 F.2d 690, 69 USPQ 330 (CCPA 1964). In this case, such reversing process steps would provide no new or unexpected results.

Regarding claims 2-3, 5-6, 13 and 15, Yu further discloses that the source/drain extension region (40/42) and the source/drain region (54/56) are implanted with an N-type dopant is selected from arsenic ions (column 4, lines 42-47 and column 6, lines 27-34), the source/drain extension dopant implant is performed at a dose of about $3 \times 10^{14} \text{ cm}^{-2}$ (column 5, lines 63-67) and the pocket doped region 50/52 is doped with P-type dopant (column 6, lines 8-14).

3. Claims 7-11 and 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yu (U.S. 6,521,502) in view of Applicant's Prior Art (APA) as applied to claims 6 and 12 above, and further in view of Wang et al. (U.S. 6,380,021).

Regarding claims 7 and 16, Yu discloses that the pocket-doped region is doped with a p-type dopant including boron (B) (column 6, lines 8-15). Therefore, it would have been obvious to dope the pocket-doped region with indium or boron because they both provide the P-type dopant, as taught by Wang (column 2, lines 57-59).

Regarding claims 8 and 17, Yu discloses that the implantation energy for the pocket doped implantation process is about 50 KeV (column 6, lines 8-12). Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to perform the implantation energy of 60 KeV for the pocket doped implantation process because it has been held that where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corporation of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985).

Regarding claims 9-10 and 18-19, Yu further discloses that the pocket doped implantation tilt angle is about 30 degrees at a dosage of $1 \times 10^{13} / \text{cm}^2$ (column 6, lines 8-20).

Regarding claims 11 and 20, Wang et al. teach the step of performing a rapid thermal process at a temperature of about 900 degrees Celsius for about 10 seconds (column 3, lines 15-19) to anneal the source/drain extension region, the source/drain region and the pocket doped region concurrently (column 3, lines 37-39). Accordingly, it would have been obvious to perform the rapid thermal process of Yu at temperature and time above because as taught by Wang, such rapid thermal annealing performing at temperature and time above would achieve shallow junctions (column 1, lines 23-24).

4. Claims 4, 7-10, 14 and 16-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yu (U.S. 6,521,502) in view of Applicant's Prior Art (APA) as applied to claims 2, 6 and 12 above, and further in view of Park et al. (U.S. 6,268,640).

Regarding claims 4 and 14, Yu discloses that the implantation energy for forming the source/drain extension region with the implantation energy for forming the source/drain extension region is about 5 KeV, but not 10 KeV. However, Park teaches the forming the source/drain extension region with the implantation energy of either 5 KeV or 10 KeV (i.e., less than 15KeV) (column 5, lines 11-15). Accordingly, it would have been obvious to form the source/drain extension region with the implantation energy of either 5 KeV or 10 KeV because the implantation energy is not critical and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Regarding claims 7 and 16, Yu discloses that the pocket-doped region is doped with a P-type dopant including boron (B) (column 6, lines 8-15). Therefore, it would have been obvious to dope the pocket-doped region with indium or boron because they both provide the P-type dopant, as taught by Park (column 5, lines 9-10).

Regarding claims 8 and 17, Yu discloses that the implantation energy for the pocket doped implantation process is about 50 KeV (column 6, lines 8-12). Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to perform the implantation energy of 60 KeV for the pocket doped implantation process because it has been held that where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corporation of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985).

Regarding claims 9-10 and 18-19, Yu further discloses that the pocket doped implantation tilt angle is about 30 degrees at a dosage of $1 \times 10^{13} / \text{cm}^2$ (column 6, lines 8-20).

Response to Arguments

Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Theresa T Doan whose telephone number is (703) 305-2366. The examiner can normally be reached on Monday to Thursday from 8:00AM - 6:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

TD
December 10, 2003


PHAT X. CAO
PRIMARY EXAMINER